CLAIMS

1. An L chain variable region (V region) of an antibody to human medulloblastoma cells, comprising three complementarity determining regions (CDRs) having the amino acid sequences defined below:

CDR1: Lys Ala Ser Gln Asn Val Gly Thr Asn Val Ala

CDR2: Ser Ala Ser Tyr Arg Tyr Ser

CDR3: Gln Gln Tyr Asn Ser Tyr Pro Arg Ala

or a portion thereof and four framework regions (FRs).

2. An L chain of antibody to human medulloblastoma cells comprising the L chain variable region (V region) of claim 1 and human L chain constant region (C region).

3. An L chain according to claim 2 wherein the FRs of said L chain V region are derived from a mouse antibody.

4. An L chain according to claim 2 wherein said L chain V region has the amino acid sequence indicated in SEQ ID NO: 26.

5. An L chain according to claim 2 wherein the FRs of said L chain V region are derived from a human antibody.

6. An L chain according to claim 2 or 5 wherein the FRs of said L chain V region are derived from a human antibody REI.

7. An L chain according to claim 5 or 6 wherein the amino acid at position 46 in the second FR of said L chain V region is proline.

8. An L chain according to claim 5 or 6 wherein the amino acids at positions 42, 43 and 46 in the second FR of said L chain V region are glutamine, serine and proline, respectively.

9. An L chain according to claim 2 wherein said L chain V region includes either set of four FRs having the following amino acid sequences:

(1) FR1: Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys

FR2: Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr

FR3: Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
Thr Asp Phe Thr Phe Thr Ile Ser Ser Leu Gln Pro
Glu Asp Ile Ala Thr Tyr Tyr Cys
FR4: Phe Gly Gln Gly Thr Lys Val Glu Ile Lys

(2) FR1: Asp Ile Gln Met Thr Gln Ser Pro Ser Ser Leu Ser
Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys
FR2: Trp Tyr Gln Gln Lys Pro Gly Gln Ser Pro Lys Pro
Leu Ile Tyr
FR3: Gly Val Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly
Thr Asp Phe Thr Phe Thr Ile Ser Ser Leu Gln Pro
Glu Asp Ile Ala Thr Tyr Tyr Cys
FR4: Phe Gly Gln Gly Thr Lys Val Glu Ile Lys

10. An L chain according to claim 2 wherein said human L chain C region is a κC region.

11. An H chain V region of an antibody to human medulloblastoma cells containing three CDRs having the amino acid sequences defined below:

CDR1: Asp Thr Tyr Ile His
CDR2: Arg Ile Asp Pro Ala Asp Gly Asn Thr Lys Tyr Asp
Pro Lys Phe Gln Gly
CDR3: Ala Tyr Tyr Val Asn Gln Asp Tyr

or a portion thereof and four FRs.

12. An H chain of antibody to human medulloblastoma cells comprising the H chain V region of claim 11 and a human H C region.

13. An H chain according to claim 12 wherein the FRs of said H chain V region are derived from a mouse antibody.

14. The H chain according to claim 12 wherein said H chain V region has the amino acid sequence indicated in SEQ ID NO: 27.

15. An H chain according to claim 12 wherein the FRs of said H chain V region are derived from a human antibody.

16. An H chain according to claim 12 or 15 wherein the FRs of said H chain V region are derived from a human antibody of subgroup I.

17. An H chain according to claim 12 or 15 wherein the FRs of said H chain V region are derived from a human antibody Eu.

18. The H chain according to claim 15 wherein said H chain V region contains four FRs having the following amino acid sequences:

FR1: Gln Val Gln Leu Val Gln Ser Gly Ala Glu Val Lys Lys Pro Gly Ser Ser Val Lys Val Ser Cys Lys Ala Ser Gly Phe Asn Ile Lys

FR2: Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met Gly

FR3: Arg Val Thr Ile Thr Ala Asp Glu Ser Thr Asn Thr Ala Tyr Met Glu Leu Ser Ser Leu Arg Ser Glu Asp Thr Ala Phe Tyr Phe Cys Ala Ser

FR4: Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser

19. The H chain according to claim 15 wherein said human C region is a γ-1C region or γ-4C region.

20. An antibody to human medulloblastoma cells composed of the L chain as set forth in claim 2 and the H chain as set forth in claim 12.

21. An antibody according to claim 20 wherein the FRs of said V region are derived from a mouse antibody.

22. The antibody as set forth in claim 20 wherein the FRs of said V region are derived from a human antibody.

23. A DNA coding for an L chain of an antibody to human medulloblastoma cells comprising an L chain V region containing three CDRs having the amino acids as set forth in claim 1 or a portion thereof and four FRs, and a human L chain C region.

24. A DNA according to claim 23 wherein said L chain V region has a nucleotide sequence indicated in SEQ ID NO: 58, 61, 63, 66, 70 or 73.

25. A DNA coding for an H chain of an antibody to human medulloblastoma cells comprising an H chain V region containing three CDRs having the amino acids as set forth

in claim 11 or a portion thereof and four FRs, and a human H chain C region.

26. A DNA according to claim 25 wherein said H chain V region has the nucleotide sequence indicated in SEQ ID NO: 80.

27. A recombinant vector comprising a DNA according to claim 23 or 24 or a portion thereof.

28. A recombinant vector comprising a DNA according to claim 25 or 26 or a portion thereof.

29. A transformant co-transformed with a recombinant vector according to claim 27 and the recombinant vector as set forth in claim 28.

30. A process for producing antibody to human medulloblastoma cells using gene recombination technology comprising a culturing a transformant according to claim 29 and then isolating a target antibody produced.

31. A single-chain Fv composed by linking an H chain V region according to claim 11 with an L chain V region as set forth in claim 1 by means of a peptide linker.

32. A single-chain Fv according to claim 31 wherein said linker peptide has the following amino acid sequence:

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser

33. A single-chain Fv according to claim 31 or 32 comprising an H chain V region having an amino acid sequence of amino acid numbers from 1 to 116 in the amino acid sequence set forth in SEQ ID NO: 80, and an L chain V region having an amino acid sequence of amino acid numbers from 1 to 106 in the amino acid sequence set forth in SEQ ID NO: 40, 43, 46, 47, 50, 51, 54, 55, 58, 61, 62, 63, 66, 69, 70 or 73.

34. A single-chain Fv according to claim 31 or 32 comprising an H chain V region having an amino acid sequence of amino acid numbers from 1 to 116 in the amino acid sequence set forth in SEQ ID NO: 80, and an L chain V region having an amino acid sequence of amino acid numbers

from 1 to 106 in the amino acid sequence set forth in SEQ ID NO: 73.

35. A single-chain Fv according to claim 31 having an amino acid sequence as set forth in SEQ ID NO: 89.

36. A DNA coding for a single-chain Fv according to any one of claims 31 to 35.

37. A recombinant vector comprising a DNA according to claim 36.

38. A host transfected with a recombinant vector according to claim 37.

39. A process for producing a single-chain Fv comprising culturing a transformant according to claim 38 and recovering single-chain Fv region from said culture.